

NON-PUBLIC?: N  
ACCESSION #: 8810060283  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Oconee Nuclear Station Unit 2 PAGE: 1 of 5

DOCKET NUMBER: 05000270

TITLE: Turbine/Reactor Trip due to Equipment Malfunction  
EVENT DATE: 08/26/88 LER #: 88-003-00 REPORT DATE: 09/26/88

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Philip J. North, Licensing TELEPHONE: 704-373-7456

COMPONENT FAILURE DESCRIPTION:  
CAUSE: X SYSTEM: SN COMPONENT: LS MANUFACTURER: M322  
REPORTABLE TO NPRDS: No

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On August 26, 1988, at 1557 hours while operating at 100% Reactor Power, the Unit 2 Main Turbine (MT) tripped resulting in an anticipatory Reactor trip. The MT trip was initiated by a false high water level indication in the "2A2" Moisture Separator Reheater (MSRH). The false high water level trip indication occurred because conductors associated with the "2A2" MSRH high water level trip switch "short-circuited" against the switch housing. The "short circuit" occurred because brittle insulation separated from the conductors, allowing them to make contact with the switch housing.

The immediate corrective action was to stabilize the unit at hot shutdown. The supplemental corrective actions included determining the cause of the unit trip and repairing the degraded conductors. The root cause of this unit trip was the shorted circuit in the MSRH high level trip switch, which was caused by the failure of the conductor insulation in the circuit.

END OF ABSTRACT

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## SEQUENCE OF EVENTS

### Date/Time Description

August 26, 1988/1556 Unit 2 was operating at 100% power.

1557 Moisture Separator Reheater high water level trip signal was received.  
Unit 2 Turbine tripped.

Unit 2 Reactor tripped.

Post trip troubleshooting began.

1800 Moisture Separator Reheater high water level trip switch was repaired.

1847 The Reactor was returned to critical.

August 27, 1988/0006 The Turbine Generator was placed on-line.

### Background:

The Moisture Separator Reheater (MSRH) System EIIS:SN! separates water from the High Pressure Turbine EIIS:TRB! exhaust steam and reheats the steam prior to supplying it to the three Low Pressure Turbines. The MSRH System includes four MSRH's, each consisting of a moisture separator section with two stages of reheaters, and two each of the following: first stage reheater drain tanks, second stage reheater drain tanks, moisture separator drain tanks, and moisture separator drain tank pumps.

Water separated from the steam in the moisture separators is collected in moisture separator drain tanks A and B. The normal flow path of water from the moisture separator drain tanks is to the condenser.

In the event of a high water level in the Moisture Separator Drain Tank, a computer alarm is sounded and recorded in the Control Room, thereby alerting Operations personnel of the condition. If the tank water level continues to increase, water will back up to a water level sensing device associated with the moisture separators. Upon detecting the MSRH high water level, a trip circuit is automatically activated to trip the Main Turbine, thereby protecting the turbine from damage due to moisture.

## Description of Incident

On August 26, 1988, Unit 2 was operating at approximately 100% full power. At approximately 1557 hours, a false high Moisture Separator Reheater (MSRH) high water level computer alarm was received in the Unit 2 Control Room. Also at 1557 hours the Main Turbine tripped which caused a Reactor anticipatory trip. After the trip, Operations and Instrument and Electrical (I&E) personnel and the Shift Engineer began investigating the cause of the trip. The Events Recorder, Alarm Typer, and Utility Typer indicated the Main Turbine trip and the Reactor Trip. The Utility Typer printout had recorded a trip due to a MSRH high water level.

The MSRH high water level indication was not accompanied by other high water level indications, contrary to expectations if an actual MSRH high water level condition had existed. In order for the MSRH high water level sensor to actuate due to actual high water level, the Moisture Separator Drain Tank (MSDT) level would be expected to backup to the MSRH. Computer alarms and level indications associated with a MSDT high level would be recorded by the Utility Typer and Alarm Typer. No abnormal MSDT conditions were recorded during this incident, thereby causing personnel investigating the trip to suspect a failure of the MSRH high water level trip circuitry as causing the trip. Also, during an actual high water level condition, a timer delay of approximately ten seconds, occurs between the MSRH high level computer alarm and the Main Turbine trip. Thereby, Operations personnel are alerted to the high water level condition. Operations personnel received no indication of a high level MSRH condition prior to the trip.

Following the trip, Operations generated a work request to investigate and repair the cause of the MSRH high level trip. Upon investigation, I&E technicians discovered that conductors associated with the "2A2" MSRH high water level trip switch EIIS:LS! were "short-circuiting" against the switch assembly housing.

Investigation also indicated that the conductor insulation, which had become cracked and brittle during operation, left gaps which exposed portions of bare conductor to the switch housing. The "2A1" MSRH high level trip switch had no "short-circuiting" present but the conductor insulation was cracked. The "2B1" and "2B2" MSRH high level trip switch conductor insulation appeared to be free of cracks and embrittlement. Repairs to the "2A1" and "2A2" switch wiring were completed at approximately 1800 hours.

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In general, the post-trip plant response was normal. The average Reactor Coolant System EIIS:AB! temperature stabilized at approximately 557 degrees.

Pressurizer level decreased from the pre-trip value of 220 inches to a minimum value of 70 inches. The Pressurizer level was increased and maintained at approximately 170 inches after the 2B High Pressure Injection EII:SBQ! pump was manually started. The maximum Control Rod Drive breaker opening time was 51 milliseconds, which was within required limits. The Main Steam EII:SB! Relief Valves responded properly. The Steam Generator EII:SG! post-trip levels were maintained at approximately 25 inches, which is considered normal.

The Reactor was returned to critical at 1847 hours that same day. The Turbine Generator was placed on line at 0006 hours on August 27, 1988.

#### Cause of Occurrence:

The root cause of the Unit 2 trip was equipment malfunction due to the "short-circuiting" of the Moisture Separator Reheater (MSRH) high water level switch conductors against the switch assembly housing, resulting in a false high indication in the MSRH.

A review of the work request history associated with the Unit 2 MSRH high water level trip switches revealed that the switches were checked by procedure as required at the last Unit 2 Refueling Outage. The procedure checks the ability of the switches to initiate a Turbine trip signal due to high water level and is required to be performed at every Refueling Outage. However, the procedure does not require technicians to inspect the switch conductor insulation.

During the Management Transient Review Meeting on August 30, 1988, it was identified that the MSRH level sensors are located such that they are susceptible to being bumped by personnel, thereby potentially causing a Unit trip. Operations personnel agreed to generate a work request to fabricate and install guards over the sensors on all three Units. Mechanical Maintenance agreed to fabricate and install the guards.

The malfunction of the MSRH high water level trip switch is not NPRDS reportable because the switch is not contained within the reportable scoping system of the NPRDS program. The MSRH high water level trip sensor assembly is Model 402 manufactured by Magnetrol.

A review of past LERs revealed that there have been other Unit trips in the past three years, of which approximately eight were due to equipment failure.

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However, none of the Unit trips were due to conductor insulation failures. Therefore this event is nonrecurring. No personnel injuries, radiation exposures, or releases of radioactive material resulted from this Unit trip.

This incident is reportable pursuant to 10CFR50.73a(2)(iv).

#### CORRECTIVE ACTIONS:

The Immediate corrective action was to stabilize the unit at hot shutdown conditions.

Subsequent corrective actions were to:

Repair the Unit 2 Moisture Separator Reheater (MSRH) high water level trip switch conductors prior to startup;

Check the Unit 1 and Unit 3 MSRH high water level trip switches and replace Unit 1 switch assemblies and heat-damaged conductors. No problems were found on Unit 3;

Review other situations in which Unit trips may be initiated due to heat-induced failure of instrumentation conductor insulation. The Turbine Exhaust Hood Thermostat was the only potential problem situation identified as a result of the review. The Unit 3 Turbine Exhaust Hood Thermostat conductor insulation was checked on September 12, 1988, and was verified as being free of heat-induced damage.

Planned corrective actions are for:

Instrument and Electrical Management to include in procedures the need to visually inspect, on a Refueling Outage basis, MSRH and Turbine Exhaust Hood Thermostat trip switch conductor insulation and to repair as necessary;

Operations Management to initiate a request to fabricate and install guards over the MSRH high level sensors on all three units;

Mechanical Maintenance to fabricate and install MSRH high level sensor guards.

#### ANALYSIS OF OCCURRENCE:

The Integrated Control System EIS:JA! responded properly during the unit trip. The Operations Control Room personnel safely controlled the Reactor following the trip. No actuation of Engineered Safeguards systems EIS:JE! or pressurizer relief valves occurred, and no Reactor Coolant System leakage was induced. The health and safety of the public were not affected by this event.

Duke Power Company  
PO Box 33198  
Charlotte, N.C 28242

DUKEPOWER

September 26, 1988

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

Subject: Oconee Nuclear Station  
Docket No. 50-269, -270, -287  
LER 270/88-03

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report (LER) 270/88-03 concerning a Unit 2 reactor trip on August 26, 1988.

This report is being submitted in accordance with 10CFR 50.73,(a) (2) (iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker  
PJN/392/amf

Attachment

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